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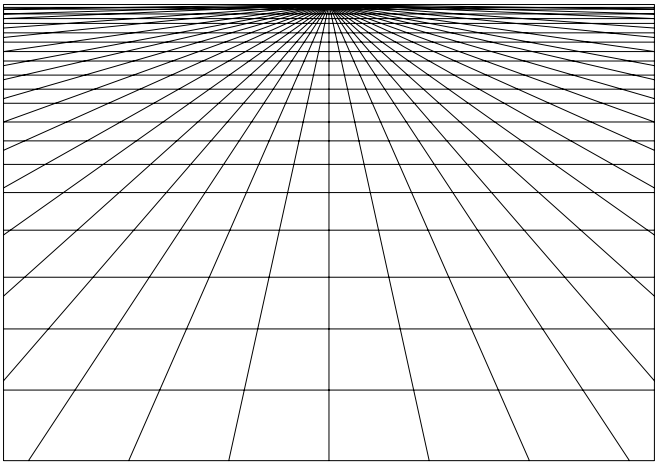

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”Incorporating User Experience when Developing Assistive Technology:

The Case of the I-Cane”

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Synopsis

This is a study of the way user experiences can be of help when developing assistive technology for blind and visually impaired. In this thesis I concentrate on mobility and orientation aids. As an example of a current development I use the I-Cane, which is under development in the Netherlands by the I-Cane Foundation. I focus on three empirical topics: visibility in society and social identity as blind, mobility and orientation in an environment and the issue of putting trust in an assistive technology. These three are a big part of the experiences blind and visually impaired have when travelling with an assistive technology, and seems to be of importance when choosing which aid to use. To analyze these topics I use three different theories: Don Ihde's descriptions of human-technology relationship, Silverstone and Hirch's concepts of domestication and consumption of technologies and Goffman's theory on stigmatization.

The empirical data is based on eight interviews with blind and visually impaired and their experiences with different assistive technologies. I chose to base this study on potential users experiences because they are the people that knows best what makes an assistive technology successful or not. They have experience with different kind of aids, and have important knowledge that should be used when developing new assistive technology.

My analysis shows that independence, security and confidence are some of the most important elements that an assistive technology can give to its blind and visually impaired user. An aid that makes this possible will help the users in a large degree to overcome the challenges their disability causes them, and enable them to live a life of their own choosing.

Key Words: Blind, visually impaired, assistive technology, mobility, orientation, I-Cane, user, experience.

Table of contents

Chapter 1

Introduction

People with disabilities encounter problems in their everyday life due to their disability. Assistive technologies are developed to help overcome these problems and let the users live the life they choose for themselves. Assistive technologies of high quality can help its users become more independent and improve their quality of life (Wessels 2004). Different technologies help the users do what they want, when they want it, without being dependent on others. Some assistive technologies are simple to use, others are more complicated. All devices require some kind of training in order to maximize the use. When developing an assistive technology for blind and visually impaired to help mobility and orientation, there are several things that must be considered. What kind of information do the potential users need? What is the best way of presenting information to the user? What do blind and visually impaired think of different kinds of assistive technologies? Another important aspect of using an assistive technology is the symbolic one. What meanings are embedded in for example a white cane? How does this affect the actions of people around the user? Different assistive tools might have different connotations inside the blind community as well as outside. These questions have to do with culture and how we attach meanings to the things surrounding us. Cultural codes play a major part in people's behaviour, and development of new technology may change this behaviour. In everyday life we recognize many different objects that are familiar to us. We know what they mean and how to interpret and behave around them. A person walking with a white cane will symbolize that the user is blind or visually impaired, and this will affect how people act around this person. The connotations and construction of identity as blind may change with increased mobility and development of new assistive technologies.

When trying to answer questions concerning these topics, the opinions of the users are one of the most important (Wessels 2004). They know their own situation best; it is their satisfaction with an assistive technology that is most important. It is their insights that are important, because they have experienced what kind of aids that works and can explain the parts that still need improvement. Assessing and analyzing technology from the users' point of view is becoming more and more common (Wessels 2004, Oudshoorn and Pinch 2003). Recognizing that the users' subjective thoughts and opinions are just as important as more objective methods of assessment (for example statistics and survey instruments), can help improve further development of all kinds of technologies. Organizations and groups that work with development of assistive technologies have also taken this into consideration, and it is more and more common to incorporate the potential user group in the processes that leads to development. Developers have realized that they don't know how the situations of disabled people are; therefore they to a larger degree than earlier want the potential users to actively take part in decision making and development (Å Navigere Uten Syn 2003).

1.1

Research Question

Assistive technology that is designed to help the blind and visually impaired must solve two important problems that is caused by loss of vision; difficulties to be mobile and orient in space, and difficulties to handle written and graphic information (Jansson 1996). Both of these problems are present when a person with a visual impairment wants to move outside. Sighted people often solve the problem of orientation with written and graphic information, like maps or street signs. For blind and visually impaired this is not an alternative. A problem with mobility is most often dealt with by using a white cane or a guide dog, but difficulties with orientation is something that is still a problem. To walk alone in unknown areas is something

blind and visually impaired usually doesn't do. Instead, they are dependent on having someone sighted to walk with them so that they can memorize and learn the new route or just stay at home if that kind of help is not available.

Foulke (1985a) defines mobility as movement through an environment with the purpose of reaching a goal. To be able to reach this goal pedestrians (whether sighted or visually impaired) have to know where they are going and where they are at all times (Foulke 1985a). They need to orient themselves in space and keep doing this through the journey. What often makes this task difficult is that the information needed to do this must be found in the environment where one is to perform the task (Foulke 1985a). Even if a person has walked through this environment many times before, there is always a chance that something has changed, and this is something one doesn't know until one is there. The changing environment is a specific challenge for the blind and visually impaired. There has been developed several assistive technologies that tries to overcome these challenges when it comes to mobility and orientation, some have been successful, others have not. An example of this is the I-Cane, an intelligent cane, with specific features. To study this specific assistive technology in relation to the challenges that blind and visually impaired must overcome; I will focus on the following research question:

How does blind and visually impaired experience different assistive technologies, and how can these experiences contribute to the development of the I-Cane?

1.2

The I-Cane foundation

The I-Cane Foundation was established in 2004, in the Netherlands by Huub Grooten. The foundation is a non-profit organisation and its aim is to make new technologies available to

blind and visually impaired. There are people from a great range of backgrounds on the advisory board, and the foundation co-operates with several institutions and organisations in the Netherlands to get the necessary founding and to be able to reach their goals (www.i-cane.org).

The foundations current development is that of the I-Cane; an intelligent white cane. This product follows the concept of a traditional white cane, but the I-Cane foundation aims to integrate several new technical functions to increase both mobility and orientation. It will be designed so that different modules can be fitted onto the cane itself using a "plug-and-play" system. In doing this it can be customized to every individual's needs and the user can choose what modules that is most suitable and when he or she wants to obtain new functions. Some of the modules that are considered are a GPS-based system for orientation (that will also be of help indoors via GSM technology), obstacles detector, a SOS system that gets the user immediate help if needed and a cane finder system. There will also be different features to make the user visible when travelling, like reflector stripes and a night time blinker (www.i-cane.org).

For my thesis, the I-Cane will serve as an example of a new kind of assistive technology, which combines a mobility and orientation aid. This cooperation with the I-Cane foundation gave me good information and examples of where the development lies today, and what might be possible in the future.

1.3

Thesis Aims and Objectives

The aim of my thesis is to come up with suggestions and advice that can be taken into account when developing assistive technology for blind and visually impaired. Instead of looking at

the topic with the perspective of a producer, I chose the “other end”; to talk with the potential users. I did this because I’m convinced that they have important information and answers to a lot of questions that may come up when trying to develop something new. In the end, they are the people who are going to use this in their everyday life, and need the aid to be developed in consideration of their needs. The I-Cane foundation had not had any in-depth conversations or interviews done, and I aim that the results of this thesis can be helpful in the further development of the I-Cane.

I have divided my analysis into three different parts, visibility, humans in an environment and trust. These topics were not something that I had chosen before I started writing, but as I started doing my interviews these were the topics that was raised again and again. Talking to the potential users and letting them decide what topics that are of interest and what questions that should be asked when developing something new, is important when having a user-focused approach (Wessels 2004). Being visible as blind was something all my interviewees were concerned with, in both positive and negative ways, and they all had opinions about this. An assistive technology becomes a part of the user’s identity, just like the impairment itself is a big part of who you are. Not everybody found the visibility of the assistive technology positive. First in my analysis, I discuss different aspects of being visible as blind and having a social identity as blind in society. This seems to be of importance when choosing what kind of aid to use. Second, I discuss how blind and visually impaired conceive and travel in different environments. When trying to solve the problems of mobility and orientation that blind and visually impaired have, you have to know how they use the environment to make routes and remember where to go. Finally, I discuss the aspect of putting trust in an assistive technology. Trusting that something outside your body can help you when loosing your sight is not always easy. But at the same time, the trust is crucial if a person is to use an assistive technology at all. The trust becomes an important factor when

deciding to use or not to use assistive technology. I wanted to find out if there are factors that make some assistive technologies easier to trust than others. This was the topic that I found most difficult to talk about in my interviewees. Some had troubles articulating their thoughts about this, simply because they hadn't paid much attention to it before. Surely they had thought about it, but several had never tried to identify the reasons why they did or didn't trust their aids.

All these three topics were familiar to my interviewees, and something that they had thoughts and opinions about. They did not always agree, but this just shows that we can't put all blind and visually impaired in the same "box". All people are different, have different needs and wishes for assistive technologies and this makes it almost impossible to create an aid that will satisfy everyone. I will argue that the three topics I have chosen to focus on are general enough to take into consideration when creating an assistive technology. These are aspects that are relevant when developing all kinds of assistive technology for blind and visually impaired, and it seems to be important for the use of assistive technology as well. Focusing on these three topics will give me the opportunity to discuss features that are important both in development and use of assistive technologies.

1.4

Assistive technology; orientation and mobility aids for the blind and visually impaired

Mobility is a central feature of social life. In most cases one has to be mobile to get to work, school and participate in social life. But a wish to be social and meet friends does not help if one is not able to travel to the place the social activity happen. For blind and visually impaired this can often be difficult. Planning a route and navigate through this is not easy, and there is a need for an aid that can solve problems that has to do with orientation and mobility. As

Jacobson (1998) points out, increased mobility and independence is important to improve the quality of life for the blind and visually impaired. To always be dependent on others when going somewhere might result in a person staying a lot more at home than one might want to, or that one only travels in areas that are well known. In this chapter I will look at some earlier discussions of mobility and orientation aids, and look at some features that seem to be important when developing these kinds of assistive technologies.

One can distinguish between two different kinds of navigation; micro navigation and macro navigation. Micro navigation is navigation in the immediate environment, and in this kind of navigation users get good help from mobility aids like the white cane or a guiding dog Aids like these help the user avoiding obstacles and walk freely (Bradley and Dunlop 2002). Macro navigation on the other hand, is navigation through a more distant environment, and this often presents a bigger problem to the blind. The blind and visually impaired can't depend on orientation with the help of street sign or landmarks, but need other forms of aids when they navigate through unknown areas (Bradley and Dunlop 2002, Strothotte et al 1996). There have been several developments of assistive technology for micro navigation and macro navigation, for example the white cane and the use of guide dog for micro navigations and use of different GPS systems and tactile maps for macro navigation (Jacobson 1998). Jacobson puts emphasis on that if devices like this are to be successful, one has to take into account how blind and visually impaired navigate without these kinds of tools. The way a blind person sees the world and the spatial knowledge this person possess isn't necessarily the same as that of a sighted person. How developers choose to mediate the environment is crucial when it comes to how blind and visually impaired experiences their environment. Some developers have chosen to represent the world tactile, by creating tactile maps and mobility aids with vibration outputs. Others have made technologies that mediate the world through sounds and audio signals. The use of different assistive technology affects the way

the user experiences the world. Knowledge about this kind of cognitive mapping (how blind and visually impaired gets and maintains spatial knowledge) can help developers assess what kind of information is needed and how to present this to the user (Jacobson 1998). As Bradley and Dunlop (2002) points out, blind and visually impaired may describe routes and put emphasis on other features of the environment than sighted people. When one can't describe a route by street signs and visually landmarks one has to find other points of reference. Sighted and visually impaired people have different needs, and wants different kind of information to be able to be as independent as possible. This means that information presented by assistive technologies, must be of a kind that are most helpful to the user; the blind and visually impaired. So what kind of knowledge can be derived from looking at the different types of technological aids that already exists? In what ways have development already been successful and what areas need more work? What kind of existing technologies can be used to improve mobility and orientation for blind and visually impaired?

For micro navigation, an assistive technology must help the user avoid physical barriers like pavement furniture, steps, traffic lights, other people etc. This is something that already used mobility aids like the white cane or a guide dog can help with, and these aids have proved to be good and effective. At the same time, the user is missing a lot of information that people with sight uses for micro navigation. A person who walks with a white cane, feels the obstacle and gets past is, but is not always able to recognize what the obstacle actually is. Another thing blind and visually impaired misses is information like street signs and different kinds of shops and buildings. One possible solution to this is the concept of "talking signs". Here information from the sign can be picked up by for example a GPS or Bluetooth, and give the information to the user by audio signals. At the same time, this kind of development is something that is dependent upon efforts from municipalities and owners of buildings and not only developers of assistive technology (Å navigere uten syn

2003). The white cane has been used since the late 1940s, and there have been no other mobility aids that have been used for a period this long (Brabyn 1985). In the 1960s and 70s there were several developments, but none that reached the commercial market. After talking to my interviewees I have the impression that there have not been any successful developments of mobility aids that are as good and effective as the white cane or the guide dog. The developments that have been made have mostly been obstacle detectors that have aimed at detecting obstacles ahead of the user at a greater distance than the white cane does. These have mostly been based on different sonar technologies (Brabyn 1985). Using the sonar for detecting the obstacles, there were many different designs and methods of communicating information to the user about the obstacles that was in their path. Some used vibration alerts, other sounds or musical scales. The designs ranged from handheld devices (the Mowat sensor) to canes (The Laser cane) and spectacles to be worn on the head (the Sonicguide). While some of these aids have been used, they are not able to guide the user alone; it works best in combination with a white cane (Brabyn 1985). So why haven't there been any successful developments in this area? In this thesis I will argue that simple devices are those which are preferred by blind and visually impaired users. The different output solutions that were used by the aids mentioned above, can for some be quite confusing. The user has to interpret the signals in order to react, and this can be time consuming and difficult[1]. Another possible solution to why these devices haven't been successful might be that they have been developed by engineers with their own theories of what is most helpful for the blind and visually impaired traveller (Brabyn 1985). Another factor is that the sensor technology used in these aids, were originally developed for other use, not for detecting obstacles in the street. The need for aids with customized technology becomes evident when looking at the problems in transferring technology originally developed for other purposes to the field of assistive

[1] Later in the thesis I will present some of my interviewees' experiences with mobility aids like this.

technology. This strengthens my argument that it is very important to cooperate with the potential users themselves and create something that fits their needs to develop something successful.

For macro navigation, there are also a number of different devices. GPS-systems exist in different versions, and there are also some that come with a route-planner programme to use at home before the journey (Strothotte et al 1996, Jacobson 1998). One negative thing about the devices on the market today is that they often just cover one specific task. For the user this means that one have to have several devices to cover all needs. Another negative thing about existing GPS-systems is that most of them are developed for use in a car. This means that it isn't always the fastest or safest alternative for a pedestrian that is suggested by the system. The ability sighted people have to look cross intersections or navigate with the help of distant landmarks are things that makes navigation and orientation difficult for blind and visually impaired. To solve this, some orientation aids have GPS-systems that enable the user to plan a route in advance and then guide them through that route using audio signals, vibration or tactile maps (Strothotte et al 1996, Bousbia-Salah et al 2005). One difficulty when developing devices like this lies in the information presented to the user. How much and what kind of information is necessary and interesting? And what is the best way to present this to the user?

In Bradley and Dunlop's (2002) study fifty percent of their informants wanted a combination of non-speech and speech output with vibrations alerts. But at the same time several studies have showed that users show a general resistance towards having to wear headphones to get audio information (Strothotte et al 1996, Probert et al 1996, Bradley and Dunlop 2002). This is because the need to navigate without sight often makes the blind dependent on other senses, like the sense of hearing to recognize environmental features. Insights from different users suggest that one earpiece is better that wearing headphones, and

that the users themselves want to control when to get information through audio signals (Strothotte et al 1996). The matter of user customisation is something that seems to be important. Not only when it comes to audio or non-audio outputs, but seeing that all users' descriptions of the environment are so unique, makes it important to allow the users to get information that fit their personal needs (Bradley and Dunlop 2002). One problem with existing aids is that there is no consideration of how the different aids for macro- and micro navigations are to be integrated into one unit. The user has to have many different aids to cover all needs, something that is difficult both practical and financial. Several of these problems are addressed by the developers of the I-Cane in hope that they can develop something that will make a change in the life quality and independence of blind and visually impaired.

1.5

Thesis outline

In chapter two, I will first present the theoretical framework and concepts I'm going to use when analyzing my data. Second, I will present my methodology and some reflections on my selection of interviewees. Next, I will start my analysis with focus on being stigmatized and having a social identity as blind or visually impaired using Goffman's theory on stigmatization in chapter three. In chapter four I will discuss different ways blind and visually impaired get information about the environment through different kinds of assistive technologies, and in what ways information can best be presented to the user. In chapter five I will focus on the concept of trust. I will discuss this by using the notions of consumption and domestication. Finally, in chapter six I will discuss the results of my analysis and try to come

up with advice for future development of mobility and orientation aids for blind and visually impaired.

Chapter 2

Theory and Methodology

In this chapter I will present my theoretical framework. I will explain the concepts I'm going to use in my analysis, why I have chosen these and how they combined help me to describe my empirical data. In the last part of this chapter I will discuss some features on methodology.

2.1

Theoretical Framework

In our contemporary society we are surrounded by technology, and humans interact with different technologies everyday. There are many ways to describe this relationship between humans and technology, and in this thesis I will use the following theoretical frames: Ihde's theory of human-technology relationship, Silverstone and Hirch's theory on domestication and consumption of technology and Goffman's theory on stigmatization. These three all have focus on the user as well as a technology or an object. This focus on the users' experience of technologies suits my empirical data well, as I have focused on blind and visually impaired people's own experience of different assistive technologies. Don Ihde's phenomenological philosophy of technology looks at different kinds of relationships between humans and technology after it has been established. When talking about assistive technology, the notions developed by Ihde can be of help when describing whether the aid is helping the user overcome his or her challenges. They also show that a user can experience the same technology in different ways, depending on the context. Silverstone and Hirch present the idea of domestication and consumption of technology. These are notions that describe the process of creating a relationship between a user and a technology. Looking at Ihde's and Silverstone and Hirch's theories in combination, I'm able to analyze how a relationship is both created and maintained. To be able to analyze the experiences blind and visually impaired gets when

walking outside and interacting with other people, I'm using Erving Goffman's theory on stigmatization. His concepts describe the effect from the bearer of the stigmas point of view, but also how the "normal" people might react and think when they interact with someone stigmatized. The combination of these theories enables me to get a more complete picture of how a relationship between user and technology is created, maintained and experienced. They describe various elements of the relationship between a user and a technology that together cover the different themes I discussed with my interviewees. I will start this chapter by describing Don Ihdes description of the relationship between users and technology. Second, I will explain Silverstone and Hirch's concepts of consumption and domestication, and third, I will present Goffman's theory on stigmatization. I will end the chapter with some reflections on methodology.

2.1.1

Don Ihde and relationships between humans and technology

Ihdes work concentrates on the different relations between humans and concrete technology, technological artefacts in their "everyday form", and he looks at the different ways that humans experience technology (Verbeek 2001). Ihde argues from a phenomenological point of view that for humans, there is no direct access to the world. The world as humans experience it is always an interpretation of something in a context. For Ihde, technology is one of these ways in which the world can be revealed to humans and he tries to give an embodied perspective of technology, but also ground this perspective in the cultural context in which it appears. With this focus on bodily activities, Ihde shows that it is through experience and use of technology that we learn about the world. An important distinction Ihde makes is the one between micro- and macro perception (Ihde 1990, Ihde 1993). Micro perception is an immediate perception and it is something bodily, like seeing, hearing or touching. Macro

perception on the other hand is a cultural perception. These two are closely linked and does not exist alone. When hearing a sound and connecting this to an object, the object is always culturally interpreted. This shows how embedded cultural codes are in our perception of things, and that humans never have a neutral idea of objects and artefacts.

Ihde describes three main forms of human-technology relations; hermeneutic relations, alterity relations and embodiment relations (Ihde 1990, Verbeek 2001, Friis Jørgensen 2003). Hermeneutic relations and embodiment relations are both mediated relations between humans and technology. The experience the user has of the world is mediated through a technology. In hermeneutic relations, the technological artefact gives a representation of the world that must be interpreted to give meaning; the user has to *read* the artefact. An example of this is a thermometer. The artefact shows us certain qualities about the world, but needs to be interpreted in order to be understood. This kind of relationship creates special interpretative actions within a technological context (Ihde 1990). The alterity relations differ from the two others especially in one important way. The relationship is not mediating, as with the hermeneutic and embodied relations, but the humans have a relationship with the technology itself, not the world through the technology. Here, technologies are experienced as quasi-others, because they often invite to a certain interaction between the technology and the user. For example many toys, robots and even ticket machines can create alterity relations between itself and the user (Verbeek 2001).

The last form of human-technology relationship Ihde describes is, like the hermeneutic relation, a mediated relation but in a slightly different way. In this embodied relation, the users get their perception of the world through the use of a technological artefact (Ihde 1990). When talking about assistive technology, this becomes true also in a more literally sense. Not being able to see, it is the use of a white cane or a guide dog, and the experience that this gives, that creates a personal image of the world for the user. Relations like the one between a

blind person and a white cane is what Ihde describes as embodiment relations (Ihde 1990, Friis Jørgensen 2003, Verbeek 2001). This is a relationship where the technology becomes almost transparent, as a part of your body. The user gets a mediated perception of the world, experiencing the world *through* a white cane. Another example of embodiment relations is the use of eyeglasses, for example for people that are near-sighted (Verbeek 2001). The common feature of all embodiment relations is a certain *transparency*. The focus is not on the technology itself, but how the world is presented through this technology. For this transparency to occur, there are some conditions that must be met: the artefacts physically design has to make it able for embodiment and the user has to have the needed skills to actually use it. One can see embodiment as an activity, once the user has learned how to use the technology, the technology withdraws and becomes transparent (Ihde 1990). Because of these conditions, an embodied relation is a good sign that the assistive technology is of high quality. If the user never gets an embodied relation with the technology, maybe something has to be changed in the design of the technology, or the user has to have more training to use it properly. The mediated perception the technology makes of the world, should also be comparable to the unmediated (by artefacts, that is) perception. For example, when using glasses the perception is pretty close to what the world would look like without the glasses. At the same time, a mediated perception is never a neutral one. In the process of making something visible and clear to the user, something else is always put in the background and reduced. Deciding on what should be emphasized and what is less important, is one of the challenges when developing an assistive technology. These non-neutral transformations happen with all perceptions mediated through technology (Ihde 1993). Ihde also puts emphasis on that all three relations between humans and technology exists in all cultures (Friis Jørgensen 2003). One technology can also have different forms of relationship with the user. Take the example of a sports car. It can develop an embodied relationship with the user

when driving; the user feels the body of the car as his or her own, and experiences the world through the motion and movement of the car. There can also be an alterity relation, where the user reads the signs from the car (for example instrument giving information about the amount of gas left). There is an interaction between the user and the car; it acts like a quasi-other. These examples show that different functions of the technology can affect the user and this can create different relationships in different situations.

So how does this relate to the development of new assistive technology for mobility and orientation? When developing a new assistive technology, it is important to make sure that the artefact mediates the world in a way that seems right to the user, and that this does not differ in a negative way from the world that previous technologies have mediated. In the case of the I-Cane the user would probably get a perception of a larger world, both geographically (because of increased mobility and better orientation) and informational (new technology may give the user more information about environmental features like shops, bus stops or public buildings). From a phenomenological perspective we can clearly see how the use and experience of different technological aids can create different perceptions of the world, because it is the experience itself that creates an image of the world. That's why it is important that new development creates a helpful and positive change, and that the users trust the new aid to lead them to this expanded world. By using different types of mobility and orientation aids, people can play an active part in constructing their own phenomenological worlds. It is through their own experience that they see the world, and different assistive technologies can create different experiences. I would like to argue that the embodied relationship between an assistive technology and its user must be a "goal" for every new development of assistive technologies that is to increase mobility. For sighted people, their eyes and the information they get through their sight is something that is not much reflected on. Because sighted people have never experienced something else, they don't take much

notice of it. They look around and see the world without thinking about it. Walking down the street with a mobility aid and not recognizing the aid itself as much as recognizing the world through it would be the ideal relationship between a mobility aid and its user. When talking about assistive technology that is meant to mediate the world to its user, I will use Ihde's embodied relationship and his notion of transparency as the ideal relationship for some assistive technologies, while for other[2] assistive technologies, a hermeneutic relationship will be the goal. Not all technologies are made to be embodied, and in these situations, as I will argue, a hermeneutic relationship will be created.

2.1.2

Consumption and Domestication of technology

When it comes to appropriation and use of technological aids, it might be useful to look at the concepts of consumption and domestication of technology. The concept of consumption might have negative connotations for some, as it is often used in the context of commercialism and shopping, as a merely economic activity. Silverstone and Hirch use this word in another and more neutral way, to describe how people obtain and use technologies and see how consumption is both a material (through concrete use) and a cultural (becoming a part of the users self) activity that often is a part of constructing people's identities (Silverstone and Hirch 1992, Oudshoorn and Pinch 2003). The notion of domestication describes how users take a technology into their private zone, and the process of making this fit into their everyday life (Silverstone and Hirch 1992). It takes time to become used to and feel safe with something new, especially when it is something that you have to trust and become dependent on in your everyday life. When one use an artefact, local routines are constructed to guide application and use. This may differ from general cultural codes and

[2] GPS is one example of this which will be further discussed later in the thesis

transform something general into something more personal that are attached to ones identity and social relations (Lie and Sørensen 1996). Development of these local routines might be one way of domesticating an object. Another way is to give the new object symbolic meanings that fit into your daily life. One example of this can be to get used to the fact that your new white cane is your new "sight" and get used to taking this with you every time you leave the house. Domestication has also a more cognitive side, you have to learn how to actually use the object, and understand how it works (Oudshoorn and Pinch 2003). You start to use the technology in your own ways, and this is not always the way that the producers intended. It takes time and training to place a new technology in the user's phenomenological world, just like Ihde describes the process of making a technology transparent. It is first when the user trusts the new aid, and almost stops noticing that it is present that it "disappears" and one only sees the world mediated through the technology and not the technology itself; the relationship is embodied (Ihde 1990, Ihde 1993). An assistive technology is something that surrounds you for most parts of the day. But how to make this new technology fit into your daily life and how to get familiar with it? One of the things Silverstone and Hirch emphasises, is that the work of production and reproduction doesn't stop when the technology moves into someone's home and use, it continues through consumption and domestication of technology. Different people and different contexts can make different interpretations of an artefact. This resembles Don Ihdes concept of multi-stability (Friis Jørgensen 2003). There is never only one way to use an artefact, and never one way to think of it. This will always change from user to user, and context to context. The technology will never be stabilized! There will always be different ways of using it and different meanings attached to it, depending on the user and the context (Friis Jørgensen 2003, Ihde 1990, Ihde 1993). The process of domestication happens when the users figure out how they want to use the technology, and defines what it means to them.

2.1.3

Goffman's Theory on Stigmatization

The Greeks used the term *stigma* when referring to bodily signs designed to expose something unusual and bad about the moral status of a person. Today, according to Goffman (1968), the term stigma is used to describe visual evidence that a stranger present before us is different from others in a negative way. It is this negative attribute that is a stigma. A stigma can create an inconsistency between a given social identity and the self perception of that person. A social identity is something that is anticipated by first impressions, and this creates expectations about a person and assumptions of how this person should be and how he or she should act. This social identity may or may not coincide with the person's self perception (Goffman 1968). People always want to display attributes that give others a positive image of themselves. As Goffman argues, this means that most people give "performances" showing the attributes that will be most valued by others. What is valued differs by contexts. By giving these performances, they try to give others the most positive impression of themselves as possible (Layder 1994). For people with a stigma it might be difficult to overcome this when trying to present their positive attributes to others. Having a visible stigma, others might base their first impressions of a person on the stigma and not other features this person might have. It is the information conveyed from the stigma that is significant, not other attributes that the person is trying to present to others. For people with a less visible stigma, this might cause them to hide their stigma, and act as if it does not exist. For people with visible and immediate stigmas, they have no choice; the stigma will in most situations be the one thing others base their first impressions on. Although a person's self identity is not limited to one image, it might seem this way when a person is bearing a stigma; the stigma becomes the master identity in interaction with "normals". There are many types of stigmas, and they always

occur in a relationship with what is conceived as “normal”. What is considered stigmatizing is dependent upon the social context. In some societies or social groups some human differences are valued and desired and other are devalued, feared and stigmatized (Coleman 1997). It is in the relationship between what is valued and what is devalued that the stigma appears. According to Goffman, this means that all human differences are potential stigmas. Moving from one context to another can show how different attributes are valued in different social groups and societies. The white cane is a good example of a stigma. Presenting yourself to someone for the first time with a white cane will show that you are different from others. Seeing a person with a white cane will create role expectations to the carrier of the stigma; that the user is blind and that he or she will behave in a certain way. Goffman is mainly concerned with face-to-face interaction between people, and he focuses on the involved actors’ point of views. One of the elements involved in social interaction is the individuals’ social identity. If the given social identity and self perception of a person conflicts, it might cause difficulties in interaction and communication. Misunderstandings of who a person is can cause insecurity and lower self-esteem. To always be conceived as different from how you see yourself, might cause a person to be less social. For stigmatized people, this seems to be a quite common experience. This is why I claim later in this thesis that many blind and visually impaired choose other, less visible, aids than the white cane when walking outside. They don’t want their impairment to be as immediately visible to others as it is when using a white cane.

The theories that I have presented in this chapter can all be used to analyse the functions or the effects of assistive technologies. Ihde describes how the different functions of assistive technologies can create different relationships between the user and the technology. Using a sports car’s different functions can create different kinds of relationships. The theory from

Silverstone and Hirch describe both function and effects of technologies. When domesticating an object you learn how to use its functions and integrate it into your routines, and at the same time the object becomes a part of creating your identity through the process of consumption. Goffman's description of stigma is also showing one effect of an assistive technology like the white cane. The different concepts described in these theories, will be used to analyze blind and visually impaired peoples experiences of different assistive technologies. The concepts help me describe both functions and effects, in different situations and at different times (from getting a new technology until one is "settled" with a technology in the every day life).

2.2

Methodology

The empirical base of this thesis is built upon eight interviews with blind and visually impaired. All the interviews were conducted in Oslo, Norway during June 2007. My reason for doing the interviews in Norway was twofold. First, it was easier for me to find interviewees in Norway. I could approach the blind organisation in Norwegian and this also made it easier to contact the possible interviewees directly. Second, I was convinced that doing the interviews in the interviewees mother tongue would give me more honest and nuanced answers than if we were to speak English.

I first contacted the blind organisation in Norway; Blindeforbundet, in hope that they could help me find people who were interested in participating. They forwarded my inquiry to their members and different smaller groups within their system. I only got a few replies from this, and saw that the method of a general inquiry was not effective enough to get interviewees. To be more specific I started sending mails and phoning people that were on the different boards and in committees of local groups under Blindeforbundet and also their youth association. This got me more positive answers, and the already confirmed interviewees

helped me by giving me names of others that they thought might be interested in participating. Because I felt it was important to meet the interviewees face-to-face, I did all the interviews in, or in the area around Oslo. I got responses from people in other parts of Norway as well, and some of them sent me some thoughts and reflections on e-mail when it was clear that we couldn't meet to do an interview. They were all very enthusiastic and eager to participate, and this strengthened my belief in the importance of my subject.

When finding interviewees to a study like this it is important to find different kind of people to cover many aspects of the topic. I ended up with interviewees that all had a connection in one way or another to Blindeforbundet. These are people that are active in the blind community, either through duties in the organisation or through other bodies like guide dog organisations etc. Initially I had a wish to talk to people that weren't involved in these networks as well. I thought that they might have different views on the subject than the ones that were active in the community. It proved difficult to find these people, but as I started interviewing, I came to the conclusion that the interviewees I had chosen could give me all the information I needed. They are what Rubin and Rubin (2005) would call "encultured informants". They knew the culture well, and could communicate thoughts and give reflections on topics that are so internalized that others might have difficulties in formulating this. The topics I wanted to talk about were something that they had an interest in, and several of them approached the interview situation with great enthusiasm. In my interviews I presented some of the different functions and modules that the I-Cane might consist of and got my interviewees thoughts and reactions to this. I interviewed a variety of both blind and visually impaired people, using different kinds of aids. They were of all ages, and came from all over the country, although they now lived in Oslo or the surrounding areas. Some of them had experience with a lot of different assistive technologies, while others only used the white cane and didn't have the need to use other kinds of aids. I also met with one sighted person,

who worked at the Huseby centre in Oslo. This is a place that teaches mobility and use of different assistive technologies to blind and visually impaired. The only "group" in the blind community I didn't get a chance to talk to, was those who were newly blind, or visually impaired who had just been defined as blind. But as several of my interviewees said; problems with accepting a new role as "blind" is very common and people that experience this and have difficulties accepting their new identity as blind, are not likely to volunteer as interviewees in a study like mine.

After doing most of my interviews, I started to reach what Rubin and Rubin (2005) calls the "saturation point"; I started getting the same answers from the different interviewees and each interview added less new information. This showed me that I had all the necessary information and I stopped recruiting new interviewees. I tried to make the interviews quite informal, often we met at a café. We talked about their experience with different kinds of aids, and I encouraged them to describe how they learned routes, how they adjusted to new aids and what kind of response they got from sighted people when they used different kinds of aids. Talking about these subjects, gave me information about many different things that are important when developing new aids for blind and visually impaired. And by getting them from the users themselves, this can provide potential developers with important insights about what potential users find important to include in an assistive technology.

In this chapter I have presented the theoretical and methodological basis of my thesis. I have also given an overview of different developments of mobility and orientation aids for blind and visually impaired. These theories and concepts are the ones I am going to use when analyzing my empirical data. I am going to use the different theories to explain different parts of my empirical data. Since I have chosen three theoretical frameworks and three empirical topics, it might be assumed that I will apply one theory to each topic. I will try to avoid this, and use the theoretical concepts wherever they are helpful in understanding the thoughts and

experiences of my interviewees. I think these theories complement each other and help me analyze all the different topics brought up by in my interviews.

I will start by discussing my interviewees' different views on being visible as blind and visually impaired in the society, and the implications this had for their experiences with different assistive technologies.

Chapter 3

Social identity and visibility as blind

In this chapter I will discuss stigmatizing and different aspects of having a social identity as blind. I will focus on two different mobility aids; the white cane and the guide dog, and show how these two can work in different ways, and portray different meanings when its user interacts with other people. The experience the users have when using an assistive technology is not solely based on functions, but also on the effect the white cane or the guide dog has on the environment and other people. Using Goffman's concepts of social identity and stigma, I will describe how a blind or visually impaired person might experience using the assistive technology outside and when interacting with sighted people.

3.1

The white cane and the guide dog

The white cane is the most recognized symbol of being blind. It has the same meaning in large parts of the world and this symbolic meaning can be helpful to the blind when walking in crowded areas, or in need of help. One of my interviewees identified two important positive things the white cane does for him: lead him safely past obstacles in the road when walking and show people around him that he is blind. Through this we can see that the white cane has one "instrumental" side; as a mobility aid, but also a symbolic side that convey certain signals to the surroundings. While the white cane is a very effective and widely approved mobility aid, my interviewees had very different opinions about the symbolic side. Being dependent on something that is such a strong and well known symbol makes the visual impairment very visible to everyone around you, and this isn't necessarily something that all users find positive. When meeting someone for the first time, or just passing someone on the street, the cane is the first thing that will be seen and recognized. Using Goffman's notion of social

identity, the first impression of a person using a white cane will always be that of “a blind person”. The social identity will be made from the visible stigma; the white cane (Goffman 1968).

All of my interviewees had at some point in their life used a white cane as the only mobility aid. In Norway there is a requirement that you are able to orient yourself and move outside with a white cane if you want to apply for a guide dog. Because of this, even my interviewees who mainly used a guide dog knew how to walk with a white cane and had used it as a mobility aid for some period of time in their life. Four of my interviewees had experience with both the white cane and a guide dog. People reacted differently towards them when they used the cane and when they used the dog. Several mentioned that people more often asked them if they needed help when walking with the cane than with the dog. When walking with the dog people around often asked different questions about the dog and its skills, but were not that eager to help the user. This shows that the white cane is a strong visual symbol for the blind community, but it’s also a strong symbol for being disabled. “Although I sometimes need help, I can manage most of the time by myself”, one of my interviewees said. Walking with the cane, people around you might think you are more helpless than you actually are. Two of the users who had guide dogs said that this was one of the reasons they preferred the dog over the cane. And even though a guide dog also is a fairly recognized symbol of being blind, it is not as immediate as the white cane. The user may look like a person taking the dog for a walk; it is when taking a closer look that one can recognize the special harness on the dog that would identify the user as blind or visually impaired. According to my interviewees; using a guide dog to “cover up” seems to be a common strategy by several blind and visually impaired who are not comfortable walking with a white cane. Here it is clear that the stigma creates role expectations. The “normals” expect a person with at white cane to be helpless, dependent upon others and insecure in the environmental

situation when walking outside and, act in certain ways because of these expectations. Although this can make it easier for a person with a visual impairment to get help, it can also be very frustrating when the help is not needed. To be in control of and maintaining your own identity is important for your self-worth and confidence (Charmaz 1997b, Coleman 1997). When people who see you think of you differently than you perceive yourself, it might be difficult to maintain confidence about who you are when walking outside. The gap between the given social identity and self perception makes it hard to be confident about yourself and your skills. The effect of the stigma is that the "normals" see you as minor to themselves. The stigmatized is someone who is weak; the stigma symbolizes a failing or a shortcoming (Goffman 1968). This was experienced by my interviewees when they were approached by sighted and asked if they needed help. In a society where independence and autonomy is highly valued, being perceived as helpless and weak does nothing good for your confidence. Coleman (1997) argues that stigmatization is one of the mechanisms that maintain social differences, and that this might be one of the reasons the "normals" wants to approach for example blind people. By doing this, they get confirmation that they themselves are still "normal", while the stigmatized person is the inferior in the situation and in the society in general. This might result in the stigmatized starting to perceive him or herself like the "normals" do; through their stigma. This had not happened to any of my interviewees, but several of them told me about experiences with other blind people that had started looking at their impairment as the only important thing about themselves. And in turn, this made it difficult for them to take an active part in society through school or work. Others (this seems to be the strategy for several of my interviewees) get their identity through redefining what's normal, and realizes that they too have a lot to offer in interaction with others and societal life.

3.2

Private and public spheres

Having a visible disability means that you cannot choose whether to tell people about your condition or not. Information about your private life and disability becomes public and visible to everyone around you (Charmaz 1997b). Most people want to be known for other attributes than illness or disability and don't want to be perceived as different from others when walking into a public area (Charmaz 1997b, Coleman 1997). This is not an option for blind and visually impaired because their disability is visible to people around them through the use of aids. One of my interviewees told me about a friend of her that still after being classified as legally blind, refused to use a white cane. She was so afraid to be seen in public using the white cane that she preferred to stay at home when she didn't have anyone to go with her. She hadn't managed to accept that she had gone from being visually impaired to being blind, and she couldn't bare the thought of other people giving her a social identity as blind because she now needed to walk with a white cane. She still perceived herself as in the past; as a visually impaired person. Before, she had been able to get around without using any aids, and it was this visually impaired person she still wanted to be. Not being able to accept the fact that you have become blind in your private life does not make it easy to travel outside with a white cane.

According to Goffman (1968), the "normals" often thinks that it is okay to ask the stigmatized about their life and their condition and offer help in situations when it is not needed or wanted. And this is also the case for the blind and visually impaired. They get questions about their condition, their different aids (and maybe especially if you walk with a guide dog) and what they are able and not able to do. As one woman said:

"Some people ask questions, and that is okay. But don't ask about why I'm blind and things like that. I can tell people who are close to me about these things, but not everybody else. They almost think it is weirder that I have a job than the fact that I'm walking with a guide dog. (…) People get irritated if I ask questions about their job, why do they think it is okay to ask me about my private life?"

When "normals" see a person with a stigma, they often see the stigma as the one important quality of the person's identity. The impairment the stigma symbolizes becomes the only important thing about this person, and it is difficult to see that except from being blind, the person lives a completely normal life (Goffman 1968, Kleege 1999). As described by my interviewee above, people are surprised when they learn that she had a job and is married to a sighted man. When seeing the white cane, they expect someone weak and helpless, who sees the visual impairment as the most important feature of ones life. When they learn that this is not the case, it is almost like they get disappointed. A blind or visually impaired who don't need their help and have full control when walking in public, does not fulfil their expectations of "a blind person". Several of my interviewees had experienced this. When strangers took it for granted that they needed help, and the blind or visually impaired said "no thank you", the sighted person got disappointed because this challenged their role expectations of a disabled person.

In a work situation, a visual impairment can be overcome by engaging in the different tasks, and not bring the impairment into the more public situation at work. Charmaz (1997a) also found this in her study of chronically ill men. By keeping their jobs and maintain values that are looked upon as important in society (for example independence and work ethics) they managed to preserve their self perceived identity instead of having the social identity as "ill" or disabled. If your co-workers find out that you have a chronic illness or some kind of

impairment, they might behave in a different way towards you and not think that you are able to keep up your work, even though in many situations the illness or impairment doesn't affect your work at all. This creates situations like Charmaz (1997a, 1997b) describes; the ill or impaired tries to hide his or her condition from others to protect themselves from being treated in a different way than everybody else. Robert Murphy (1990) also talks about this, when he compares some disabled people with "super-moms". To avoid being defined solely as a "cripple"[3], he describes people he calls "super-crips". These are people that work harder than other people, travel on vacations and take part in all kinds of social events. This shows the world around them that they are not that different from everybody else just because of their impairment (Murphy 1990: 95). All of my interviewees had jobs or went to school. As long as they got assistive technology to help with for example computers and telephones, they could do their work just as good as everybody else. Georgina Kleege, who is a blind author, describes this from her work experience. In her job as a social worker, she never told anyone about her impairment. She held speeches by memory and learned to use her head and eyes in a way that didn't reveal that she could not see the people she was talking to. For her, the visual impairment was an irrelevant factor about her private life, like religious beliefs or political view and didn't have to interfere with her work (Kleege 1999). Only after her sight got gradually worse, and she had to start using a white cane, did she tell people she worked with that she was blind. Having a job and doing the same things as others at the work place gives confidence. By not letting the impairment overcome your actions at work, you show that being blind does not affect all parts of your life; your identity consists of more than the stigma. This might also affect how sighted people think of blind and visually impaired. By working together and experience that the impairment can be overcome, sighted might change their attitudes towards stigmatized people. As Murphy also points out, when interacting with

[3] Murphy writes this book on his own experience of slowly becoming a quadriplegic.

a disabled, many people only sees “disablement”, something that can affect the way they behave. Some talks really loud to blind people, even though there is nothing wrong with their hearing. Others might think you are dumb because you are in a wheelchair. It is not expected that someone stigmatized should be intelligent or active (Coleman 1997).

To bear a stigma when interacting with a “normal” will always affect the situation. Some will treat the stigmatized as if they are nothing but disabled, others will try to “normalize” the situation and overlook the stigma for then never to return or contact you again. Having experienced difficulties when socializing with “normals”, might also create an obstacle to move around and be an active person. This might also explain why some groups of disabled (for example deaf people) form rather tight communities.

3.3

Visibility and well-being

Several of my interviewees had difficulties in handling the symbolic meaning of the white cane when they first became dependent upon a mobility aid. To walk with the cane in public was a huge step for them, and although they saw how helpful the cane was and that the visibility could be important for their safety, several of them were still uncomfortable when having to use it. As one of them said:

“I feel very blind when walking with the white cane. I feel that everybody can see that I don’t have vision. When I walk with my guide dog, I feel more covered and a bit more anonymous”

This follows the thought of Goffman (1968); that a person with an immediate apparent stigma makes great effort to not let the stigma be centre of attention. Walking with a guide dog, people taking a close look can still see that you are blind, but it is not as immediate as walking

with a white cane. Also people with a less visible stigma, for example people with hearing impairment will try to cover this up the best they can in unfamiliar situations. Hourula (2007) interviewed people with hearing impairments and found that in situations when their personality and social identity would reveal their impairment, they tried to hide their disability or compensate for it in some ways. They could try to excel in other areas to overcome their disability and preserve the feeling of their self perception also when interacting with others. The stigma would still communicate "hard of hearing", but the identity could be that of "a hard working person". For Hourula's interviewees, this was one of the ways to hide their disability during the work day or a period of studies; to turn other peoples associations of you into something else than the hearing impairment.

The groups that might find the use of he white cane most problematic are the visually impaired and the newly blind. Starting to use a mobility aid that is so well known, and have such strong symbolic message attached to it might be difficult. To know that most people who see you walking with the cane will immediately categorize you as blind is difficult if you have just been defined as visually impaired or you have trouble accepting a new identity as "blind". Having been a "normal" your whole life, re-identifying yourself as a stigmatized will always be problematic (Goffman 1968, Charmaz 1997a). This may cause a long and often difficult process of consuming and domesticating the new aid and some users may never feel completely comfortable and relaxed when walking with a white cane. If the white cane never becomes a part of the users self perception and identity the visibility the cane gives might not help much for the user's safety. Being confident about your skills when walking outside is just as important as visibility when it comes to being safe. Taking decisions about when to cross the street can become dangerous if you don't have the confidence to trust your own knowledge about the environment.

One of my interviewees, who is visually impaired, explained that she didn't think people understood that using the same kind of aids as a blind, doesn't necessarily mean that you are blind. When walking with a white cane, everybody immediately took her for being blind. They expected certain behaviour, and were surprised when they realized that she had some vision. Again, the user of the white cane doesn't fit with the expectations sighted might have. The "normals" don't see the big difference between the two groups. But for people with visual impairments it is a big difference, both socially, legal and practical, between the blind and the visually impaired. This was also confirmed by Hourula (2007) and his interviews with people with hearing disabilities; they made a big difference between the label "hard of hearing" and "deaf". While it can be difficult to balance these different labels for the "normals" it is of great importance to the disabled. To get a social identity as blind, when you perceive yourself as visually impaired is not always easy. Maybe sighted people get confused or surprised when they understand that the user of a white cane is not completely blind. The visually impaired does not fulfil their expectations the stigma creates (many blind people might not fulfil these expectations either) about being a weak and helpless person.

My visually impaired interviewee's vision has kept getting lower over the years, and she had a hard time adjusting to the white cane when she had to start using it. Although she had no problem using it outside now, she still folded it together when she went into stores. For example, walking into a clothing store with a white cane attracted a lot of attention from the sales personnel, wanting to help you pick out an outfit to buy. For her, the unwanted help and attention caused by the white cane, and the personnel immediately giving her the social identity of a blind, were still a problem. But even though she sometimes covered her handicap she was glad she had gotten comfortable using the white cane outside:

"Now, I have so low vision that it is of no use pretending otherwise. I would rather be visible as visually impaired because of the white cane, than be visible because I stumble and fall on the street or walk into things or other people because I can't see them."

This interviewee showed me the two different aspects of the white cane very clearly. As a mobility aid it gave her all the help she needed. The process of consumption and domestication had been long, but now she was no longer embarrassed to walk with it. She felt safe using it, and no longer cared what people passing on the street thought of her or her condition. But in some situations, the symbolic message and the multi-stability of the cane caused problems for her. Sighted people read the symbol of the white cane differently than she does, and give her a social identity that doesn't fit her picture of herself. In some contexts, for example in a clothing store, the ways the "normals" interpret the white cane make her cover her stigma. It is in situations when she has to interact with other people that the multi-stability becomes a problem. It is difficult to interact and communicate with someone who has an image of you that does not coincide with your self perception. For my visually impaired interviewee, it was difficult when people took her for being completely blind. There was often confusion and misunderstandings, because they based their first impression of her on her visible stigma. When walking with the cane on the street it is no problem that people think that she is blind because she doesn't have to interact with these people. Maybe more knowledge and awareness of disabilities and assistive technologies in general can help visually impaired users feel more comfortable with the multi-stability of the white cane. If sighted knew that the white cane could symbolize more than one thing (the user being blind) maybe they would react to it in a way that is more comfortable for visually impaired users.

Some of my interviewees had no trouble using the white cane or the visibility it gave them. Although they recognized that other users might find it difficult, it has proved to be a

very effective mobility aid and they saw the visibility as something positive and helpful when being around other people. In their domestication process they made their stigma into an ally. Following Charmaz' (1997a) description of this process, making an ally out of your difficulties might help you to turn the different sides (both practical and symbolic) of your situation into something positive. One way to do this was described by one of my interviewees: she used the role expectations created by the stigma to her advantage. When she knew she had to walk in areas with a lot of traffic, she always used her cane. When doing this other pedestrians and drivers in cars were eager to help her and give her clear signals for example when it was safe to cross the street. She had learned how to get something positive from being perceived as disabled by sighted people. This interviewee usually used a guide dog when walking outside, but recognized and took advantage of the fact that the symbolic message of the white cane made it easier for her to get help in difficult and complex traffic situations. When she knew she had to travel in difficult areas, she brought her white cane instead of, or in addition to the guide dog.

The safety of being recognized as a visually impaired may not always overcome the need of well being. Even my interviewees that were born completely blind knew and felt that they looked different than others when walking with the white cane and to be different was something negative. Different users might consider this differently, and this is also something that can change over time. One of my interviewees told me that she hated the white cane when she first had to start using it. As a teenager, even though you can't see yourself in a mirror, you become aware of you appearance and the white cane is not the most popular accessory in high school:

"You know, it's not very cool to be a teenager, using a white cane and be very visible. When visual appearance started to matter for the people around me, it turned out bad for me. Maybe I had a fear that the people around me would think I was weird?"

But as she got older, she started appreciating how safe she felt using it and the safety overcame the uncomfortable feeling of being visible. She said that when walking in areas with traffic, people always appreciated that she gave them a signal about her impairment. The cane helped her as a mobility aid, but the symbolic message also helped the people around her to understand why she might not behave like everyone else. Again, for others of my interviewees, the feelings from being bullied as a kid still made walking with the white cane as an adult something uncomfortable. For them the feeling of well being was more important than the immediate visibility the white cane gave them. This was also found by Hourula among his hearing impaired interviewees. People with traumatic childhood experiences tried to pass as a person with normal hearing, and in time learned different techniques so that people around them would not detect their disability. They covered their stigma when meeting people they didn't know (Hourula 2007).

In this chapter I have discussed different sides of the white cane as a stigma and my interviewees' experience of being visible as blind or visually impaired among other people. Some of them didn't have any problem with this; other found it very difficult revealing their impairment in public. People will always be different and this creates challenges when trying to make an assistive technology that can be used by many different people. But at the same time, the thoughts of my interviewees concerning these topics are very important for the safety, well being and confidence of blind and visually impaired. Feeling comfortable with your assistive technologies always helps when moving in an environment. If this confidence

is greater without the visibility of the white cane, some might choose another mobility aid because of this. I would argue that some blind and visually impaired ends up having to choose between using a white cane for visibility and their well being. Doing this, the solution will for many be a guide dog, but for some it might cause them to be less active and more dependent on others when wanting to move outside. Having discussed the symbolic side of the white cane and the guide dog, I will continue to the more instrumental side in the next chapter; what information the users need and get through different assistive technologies to be able to move around.

Chapter 4

Humans in an environment:

Emerson Foulke claims that “what humans are able to do in space depends heavily on what they remember about it” (Foulke 1985a: 463). For blind and visually impaired this becomes the reality: when walking alone, they have to trust their memory about the environment to guide them. They can’t rely on street signs or maps like the sighted, but must find different environmental features that can ensure them that they are still on the right route while walking.

Some important features when it comes to mobility and orientation are common to both sighted and visually impaired pedestrians. In order to reach a goal, all pedestrians have to know where they are, where they are going and how to get there (Folke 1985a, Å navigere uten syn 2003). What kind of information is necessary for blind and visually impaired to be able to do this? And what is the best way to get and communicate this information to a blind or visually impaired person? In this chapter I will look at different ways blind and visually impaired get to know and move in the environment. I will look at both mobility and orientation and discuss different ways to approach challenges for blind and visually impaired.

4.1

Learning and remembering routes

When learning new routes, almost all my interviewees were dependent upon a sighted person to lead them through it the first time. For a few persons, this was enough. They got the help they needed to find appropriate check-points and with the help of these they could walk the route alone the next time. For others, company of a sighted was needed several times before they felt safe enough to walk a route alone. For my interviewees, this process of always having to learn and memorize new routes and not being able to walk alone in unknown places

were one of the most negative side of being blind or visually impaired. This made them dependent upon others, and although all of my interviewees were very active, they could tell me about a large amount of blind and visually impaired that spent a lot of time at home, simply because they didn't know how to move outside or they didn't have sighted people to go with them to learn routes. One important thing that many sighted may not think about is that one route back and forth is not the same thing. It is two different routes and you need to find different check-points and remember different things to be able to go both back and forth. It is a lot to learn and memorize, and it takes a lot of time and effort to do this. Another issue is that the starting point of a route is in most cases your home. It is very difficult to move from one route to another, and because of this a blind or visually impaired have to go home each time he or she wants to start a new route (Å navigere uten syn 2003). Because of this it takes a lot of time and effort just to be able to go to the bus stop, pick up kids in kinder garden or visit a friend.

As mentioned above, it is important to find good check-points when walking a route for the first time. A check-point can be anything from poles, fences and corners of a house, to the sound (or smell!) of a particular store and changes in the ground textures or bumps in the road. This helps divide the route into smaller parts and tell the user for example when to make a turn or inform them about the best place to cross the road. The check-point is stored in the memory, together with a specific type of action that is to be carried out when the check-point is recognized (Mallot 2000). One important thing several of my interviewees pointed out is that it is not always easy for a sighted to tell the blind about good check-points. As Bradley and Dunlop (2002) found in their research; blind and visually impaired used other features to describe a route than the sighted. Blind and visually impaired put focus on structural (road, monument, church), environmental (hill, river, tree) and descriptive (steep, tall) categories. Sighted used more textual-structural (name on streets or shops) categories and they did not

use sensory or motional categories at all. These differences in describing the environment are also found by Harper and Green (2000) in their paper on the "travel task" of blind and visually impaired. Therefore it is important that the sighted and visually impaired co-operates when detecting check-points. Earlier research has discovered these things; what kind of environmental features blind and visually impaired use when travelling (Bradley and Dunlop 2002, Foulke 1985b). The next step might be how this knowledge can be integrated into the future development of assistive technology. It is important to give the users of assistive technology information on their own terms. Most blind and visually impaired already have some mobility and orientation knowledge, and it is important to build upon this existing knowledge and not start out from something completely new. Several of my interviewees pointed out that the names of the streets they passed weren't that important to them. They used other features of a street to describe it than the name. The only time the names became important was when interacting with sighted people. The blind or visually impaired have focus on other features than the sighted, for example by using smell and hearing in other ways than the sighted does. But this can also be unpredictable; as one interviewee told me:

"I have a route at home where one of my check-points is the sound from a big rock. But if it is really windy, I can't hear it and then I will go too far. Challenging check-points like these can be avoided with the help of a GPS"

This also shows how difficult it can be to orient in a changing environment. Changing weather conditions can be enough to conceal a check-point and cause the pedestrian to walk outside the route. This unpredictability is something that might affect how active a person is. If one is always nervous that something might have changed since the last time, it might cause

a person to become inactive and be a lot more at home. Predictability seems to be one of the most important factors to improve confidence and self-esteem.

Emerson Foulke (1985a) uses the word *schema* when describing how blind and visually impaired learn and memorize routes. A schema is an internal model of the world made by the memorial representation of experience a person gets from walking a route. While the route is the physical roads and streets in "real life", the schema is the representations of this in the mind. In a very simple way, I would describe a schema as a chain of the different check-points in the route. These schemas can be described as selective; they only contain the information that is of importance when trying to reach a goal (Foulke 1985a, Mallot 2000). An example of this can be that many of my interviewees didn't consider street names important. They chose other features of the environment when finding check-point and in this way creating their schemas. This process of choosing some information over other resembles the reduction/enhancement relationship in Ihdes theory of embodiment. When an assistive technology mediates the world to a user, some features are always put in the background while others are communicated. An example of this using a white cane, can be that the cane gives you information about the ground where you are walking, but gives you no information about what the environment is like outside the road. You have to use other aids or methods (for example the sense of hearing) to get information about this. Another important feature of the schema is that the pedestrian is able to orient and locate oneself in the schema, by identifying which check-points that have been passed and which ones lie ahead. Feeling insecure when having to walk in unknown areas might come from the fact that the pedestrian doesn't have a schema to follow or that there are gaps in the schema. This is also mentioned by Jacobson (1998) in his article about cognitive mapping and knowledge about space. A feeling of vulnerability in certain areas or spaces might be caused by gaps of knowledge (Jacobson 1998:301). One of my interviewees actually used the expression "to walk on a

schema” when describing her way of learning different routes. When walking the route with a sighted she made a simplified schema of this route in her mind and it was this she conferred with when trying to remember where to go the next time she walked there. You don’t have to remember every single feature about the route, you choose some of them and make these into a schema that you confer with while walking.

4.2

Mobility using the white cane or a guide dog

When walking a new route for the first time, several of the interviewees told me that they preferred to use a white cane. This gave them very detailed information about the environment they moved in, and was of big help when locating different check-points that helped them travel safe and remember the route correctly. They could detect small details about the road, buildings next to the road and different features about the pavement and curbs. When walking with a dog you are lead past all the obstacles, and you may not even notice that they are there. This makes it harder to get an image of what the environment is like. Foulke claims that it is this richness of details that makes the white cane such a good mobility aid. It looks where the information is; on the ground where the pedestrian is about to walk (Foulke 1985b). Therefore, I think it is important that the I-Cane is developed with the possibility to use the cane as a mobility aid, since this has proved to be very effective for getting the needed information. Getting to know all the details in the route with the white cane also made it easier to give clear and concise commandoes to the guide dog when walking the same route at a later time. You know what to expect and this makes it easier to find it with the cane. The dog doesn’t know more than the user about where to go, so it is important to always give clear commandoes about where the dog shall lead you.

When walking a familiar route, those of my interviewees who had a dog, said that they preferred to use the guide dog over the white cane. One of the reasons for this preference is you can walk more relaxed with a dog than you do with the white cane. You don't have to search for all the obstacles in your way; the dog leads you safely past them. The user can keep focused on telling the dog where to go, and not so much on avoiding obstacles. In many cases it is quite time consuming to walk with a white cane. When for example entering a bus or a train you have to feel your way to find the door if no one is there to help you. Or when entering a building, you have to spend time finding the door and the door handle. In situations like these, a dog can be of great help. The user can ask the dog to search for an entrance instead of using time doing it yourself or asking others to help you. The interviewees that had experience with both guide dog and white cane, all agreed that using a guide dog was more relaxing and in most situations more practical than using a cane. Two of the guide dog users had experience with using the dog and a cane in combination, and said that this gave them all the advantages of the guide dog, but at the same time they felt more in control and got a more detailed overview of their environment when combining it with the use of a cane. This shows how different aids can be used to perform different tasks. Experience with different assistive technologies teaches the users what the strengths and weaknesses of different aids are. By using different aids in different situations, the user will get the best possible help in every situation. Not all blind and visually impaired have access to several different aids. My interviewees, who only used a white cane, said that this gave them all the help they needed at the time. Some told me that they might get a dog at a later time in life, but as for now, the cane gave them everything they needed.

The I-Cane foundation has planned to keep the design of the white cane when developing the I-Cane. It will in a way be a traditional white cane, but integrated with several other functions and this will make it a combination of a mobility aid and an aid for

orientation. One of the reasons for doing this is to use an already existing symbol, instead of creating something new that people are not familiar with. There are specific meanings attached to the white cane, and it is important to continue to communicate these meanings when developing new aids as well. Most of my interviewees agreed that this was a good solution. A symbol that is established and convey a specific meaning in a big part of the world, lower the boundaries for asking for and getting help when needed; people understand why the user might need their help even though they might not speak the same language. But at the same time there are things that need to be considered when developing the traditional cane further. One thing all my interviewees mentioned was that most importantly, the cane has to be light and easy to use and bring everywhere the user would like. If the cane gets too heavy, it's no longer a practical mobility aid. It can be difficult to establish an embodied relationship between a user and a heavy cane with several modules attached to it; this will take away the focus on mobility. This is also pointed out by Verbeek (2001) in his article about Ihdes embodiment relations: the artefact must be designed in a way that allows it to be embodied. If the user is more concerned with the artefact itself then the world mediated through it, there are no possibilities for creating an embodied relationship. The user has to *want* to use the assistive technology, and one of the easiest ways to ensure this is to design to be easy to use and conveniently to carry with you. At the Huseby centre, I was showed a cane that had an integrated object detector. It had two different sensors that warned the user about obstacles through vibrations. My interviewees at Huseby told me that they didn't know about anyone in Norway who used this at the moment, simply because it was too heavy to walk comfortably with and the signals were to difficult to read. The transparency of the embodied relationship will never occur if the user gets tired from using it, or it is unpractical to use because of its design; the user will always be very aware of the aid itself. Something that is meant to give increased mobility will never work if it is too difficult and tiring to handle; the

design of an assistive technology is very important for its functionality (Ihde 1990). Several interviewees suggested a device that could also be attached to a dog harness. Doing this, you still get the combination of mobility and orientation aid in one, but the challenges of weight and practical design isn't that big an issue. It is not necessarily the best solution to attach something to the cane itself, if this can't be done without making the cane a less effective mobility aid. It is important to remember that the traditional white cane is a good aid in itself and not take away the users opportunities to use it as a mobility aid, even when it is further developed. All of my interviewees were positive towards integrating mobility aids and orientation aids in one piece, but not if this meant lowering the quality of one or the other. In the case of the cane I was showed at Huseby, the interviewee had especially one suggestion on how to make this a better aid. The cane had two sensors for detecting objects, one in eye level and one on ground level. But, as my interviewee pointed out, when the aid is designed as a cane you don't really need the sensor on the ground level, you just use the cane to detect the objects. This may be one easy way of making a device like this less complicated. Use the cane as usual to find objects in the walking path and get help from the sensors to detect obstacles that you can't detect by using the cane.

4.3

GPS based orientation aids

There have been many attempts to develop new assistive technology for micro navigation, but according to Jacobson it is only the last decades that there has been attempts to solve the problem of macro navigation (Jacobson 1998). Many of these assistive technologies have been based on Global Positing System (GPS).

One important thing to have in mind when talking about GPS for blind and visually impaired users, is that it is an orientation aid. Having a GPS for orientation, the user still

needs another aid for mobility (for example a white cane or a guide dog). And as all my interviewees emphasized; it will never replace any forms of mobility training and spatial knowledge. This training and knowledge is something that everybody who wants to be active and move around must have. Even though a GPS can tell you where to go, it is still important to learn the route and not only follow the commands from the GPS. The area where the GPS was of big help, was in the process of learning and remembering routes, and for some of my interviewees it also made them feel secure enough to walk alone in unknown areas. This made them less dependent on other people, something that is very positive. There are few GPS based aids today that are customized for blind and visually impaired users, and this might be where the biggest challenge lies. I think that a GPS is able to give a potential user a big amount of the information they need to feel safe outside, but it is a matter of having an aid that is made especially to fulfil these needs and give this specific information.

About half of my interviewees had tried a GPS (although only two of them owned one), and they had used them in different ways. One of them told me that she only used it in areas that she had some knowledge of:

"I might have certain knowledge of the area I'm walking in, and maybe I want to extend this a bit. I can decide that today I want to go here, go to the right and take the parallel street instead of walking my usual route (…) it is fantastic in combination with my guide dog!"

This user never walked in completely unknown places with her GPS. But it helped her extend her spatial knowledge of areas, and she especially found it helpful in the city where the environment and traffic situation can be a bit chaotic. For her, this meant that if one street was blocked, she could get enough information about the surroundings from the GPS to use another street and then get back on the intended route. Another interviewee told me that she

had planned a route on the GPS at home that she had never walked before, and walked this with the help of her guide dog and the directions from the GPS. For her, the GPS made it possible to walk places she had never been before; and to do this alone. The GPS can take away some of the unpredictability of any environment; both in known and unknown areas. As mentioned above, it gave some user enough information to travel alone in unknown areas. For others the possibility to make your own "points of interest" could also help you in known areas. Having check- points that was detected by the users hearing could in some situations be unpredictable. With the possibility to register the check-point on the GPS, the user felt more secure about not missing it, for example because of weather conditions.

One kind of information that all my interviewees pointed out as important, was to get a description of crossing roads; how many roads met and how they were positioned. This could be described by the GPS, and it made it easier to get knowledge about the environment; the user could be informed that there were more than two roads that met in the cross, and could be more aware about the traffic situation if a difficult crossing lay ahead. In complex environments with a lot of traffic, my interviewees also appreciated the possibilities to plan a route in advance at home. This function makes it possible to sit at home and "walk the route in your head". You get prepared for the environmental situations and this gives you knowledge of what lies ahead in the route and what to expect. Another feature with the GPS that all of my interviewees appreciated was the possibility to always be informed of where you are. On the orientation aid most of them had tried, there was a button they called "where am I button". By pressing this you could get information about your exact location. Although this function was something all who had tried spoke very positive of, this function is a clear example of getting information on sighted people's conditions. When pushing this "where-am-I-button", the information the user got, was the name of the street he or she was in. Even though the name of the street is not important to many blind and visually impaired, they had

to learn this to some extent, because without this knowledge the “where-am-I-button” will be of no use.

Getting a customized GPS based orientation aid could make a lot more people more active and more independent. It creates an opportunity to be less dependent on sighted company and explore new areas alone. But all of my interviewees agreed that it takes a lot of courage to walk with an aid like this, and that you have to be an active person from the beginning. People who stay a lot at home will not benefit from this to the same amount as the active ones. Both because you have to be tough to do this, and because you need a certain amount of spatial knowledge and experience of walking in different environments before a GPS can be of great help.

When dealing with technologies like a GPS, it is important to create a good solution on how to present information to the user. For sighted, the GPS usually consists of a visual map on a screen and an audio output (voice) telling you where to go. For blind and visually impaired the screen is not an option and audio output may also cause problems for some. The fact that blind and visually impaired use their hearing to identify environmental features much more than sighted, can make it challenging to make a satisfying solution for an audio output. Several authors who have written about this have found their interviewees sceptical towards audio output (Bradley and Dunlop 2002, Strothotte et al 1996). In my case, several of my interviewees had tried different assistive technology with audio output, and had positive experience with it. They pointed out that it was by far, the easiest and simplest way to get information, and this weighed up for any loss of environmental sounds. As long as they used just one earpiece and this was attached to the outside of the ear (not something that needs to be pressed into the ear itself) it worked out okay. The only one of my interviewees who didn’t want to use audio output had a hearing impairment in addition to her visual impairment. For her, some kind of tactile solution would be preferred. Assistive technology that has

alternatives to audio output is not that common, and not many of my interviewees had tried other output than audio. One exception was the cane with obstacle detector that I was shown at the Huseby centre. This had a vibration output on the handle of the cane, and a couple of my interviewees had tried this cane, or something similar. They said that when using this, they concentrated so hard on interpreting the vibration signals that it was difficult to react in a proper way to the signals. To be able to both read the signals and react to it in a proper way some of the interviewees told me that they had to stop each time they got a signal. This gave them time to interpret and then do the required action, but at the same time this procedure was very time consuming. It also took focus away from remembering your route. One of my interviewees also said that it was difficult to picture using this in the winter, because it was not possible to read the signals when for example wearing gloves. Following these arguments, an audio output might be preferable, simply because it is the easiest way to communicate the information; it doesn't need a lot of interpretation from the user. As long as the earpiece is made in a satisfying way, most of my interviewees saw no problems in getting information through audio.

In this chapter I have discussed factors that are important for blind and visually impaired when travelling in an environment. I think the most important thing an orientation aid can do for its user is to increase independence and make the surroundings more predictable. There can be more than one way to do this, and I think the I-Cane foundation is following a line that is becoming more and more promising; incorporating a GPS as one of the modules of the I-Cane. A GPS has possibilities that can help its user with both independence and increased predictability. But it also takes a big amount of training and instructions if it is to be of great help. In the next chapter I will discuss one very important factor if the I-Cane is to be successful, namely that the user has to *trust* the technology to give them correct information.

Chapter 5

Trust and independence through domestication.

People who are blind or visually impaired have to trust different assistive technologies to give them the information sighted get through vision. Sighted have in most cases no problem trusting the things they see, and this should be a goal for the blind and visually impaired as well; to be able to trust that the assistive technology gives them accurate and important information about the environment they travel in. Ihdes (1990, 1993) description of an embodied relationship between a technology and a user take this kind of trust for granted; the assistive technology becomes a part of the user's body and you experience the world through the technology. When a blind or visually impaired person manage to create a relationship like this with an assistive technology, it will affect their confidence, self esteem and hopefully make them more independent from other people. Domesticating a new aid has to do both with the instrumental and the symbolic side of the aid. To get the most out of it you have to learn how to use different functions and integrate the aid into your life and daily routines. While doing this, and getting used to a new aid, both the technology and the person might change (Oudshoorn and Pinch 2003). There is never only one way to use a technology, and by finding out what is the best solution for you, the technology and user adapt to each other. Although a technology can never fully replace the ability to see, it can provide the user with information and a predictability that can enhance safety and give the user self esteem and courage to move around in the environment without being dependent on others. In this chapter I discuss how this trust between a user and an assistive technology might be created and different aspects of how this will affect the user. I will use as examples the three assistive technologies my interviewees had the most experience with; the white cane, the guide dog and a GPS based orientation aid.

5.1

Domesticating and consuming a new aid

When a blind or visually impaired person has a need for an assistive technology, it is important to evaluate the different possible aids. In Norway, you always start with a white cane. There are differences from place to place, but usually you get some hours of mobility training and learn different techniques to use the cane in an efficient way. You learn how to use it to improve your mobility. With the white cane it is common that the users have to take great responsibility for their own learning process. There are not that many places in Norway that offers a lot of training with instructors, and the process of experience and trying becomes important when consuming and domesticating the cane. The user has to decide for oneself how one wants to use it, and the embodiment happens through experience. Another feature of consuming a new aid is that the user has to get used to the visibility and stigmatization that becomes a part of your identity when using a white cane. Both of these factors play a part in the process of consuming and domesticating an assistive technology. You learn how to use it, integrate it into your daily life and routines and while doing this it becomes a part of your identity. After this the identity is not complete without the assistive technology. This was described by one interviewee who was visually impaired:

"Last week I forgot my cane at work (…) everybody in my neighbourhood is used to seeing me with the cane, and I thought: what do they think of me now? When I'm walking without it? Maybe they think that I have been acting the whole time? So, now I have got a cane at home in reserve. So I don't have to deal with that again. Now [that I have gotten used to it] it is almost more embarrassing to be seen without it"

She was able to walk without the cane, but felt so much safer with it that she preferred to use it every time she left her home. Her experience when she forgot the cane shows that it has become a part of her daily life and identity. Through this period of consumption and domestication the process of embodiment takes place. Through training and use the users attain skills that make them "forget" that they are using a white cane, and starts experiencing the world through the cane; it becomes embodied. The cane is no longer a mere object, but has become a tactile organ (Iwakuma 2002). This embodiment process that occurs through domestication is by Iwakuma identified as one of the reasons so many people have a love/hate relationship with their assistive technologies. They tend to hold on to their old world, without seeing that it has been changed by their impairment. As one of my interviewees said "when you loose a sense, you will automatically get some problems with that." This is not always easy to admit. Iwakuma claims that especially for newly disabled, this "fear" of the assistive technology comes from the fact that they have started embodying something that is a stigma. Although they realize that something has changed and they have to adjust, it is not easy to actively make yourself a stigmatized person.

To get a guide dog in Norway you first of all have to attend a course to get information, and be sure that this is really something you want. After this you get a dog, and live with this dog for almost three weeks on a "training camp". You get to know your dog, and learn how to walk with it and give commandoes. After these weeks, an instructor also helps you for one week in your home environment. The first weeks the process of consumption is mostly about getting to know the dog, learning how to use it and getting used to the thought that this will become a big part of who you are. The last week helps you domesticate the aid into your home and private life. In this way, the organizations that train the dogs are confident that you have been through a process of domestication and consumption that makes this aid a part of your identity and your everyday life. The process of

consumption is about obtaining something new and creating an identity that will fit with this newly obtained object. Domestication takes place in the familiar, domestic area of the home, and helps create a space for this new technology, both in local routines and in your identity. So, using the guide dog as an example, the process of domestication takes place in the home and familiar environments, while consumption can also take place outside the home; in the training camp.

The white cane and the guide dog are both mobility aids and technologies that allow for embodiment. A GPS based orientation aid on the other hand, is an aid that can create a hermeneutic relationship with the user. It gives certain information about the environment, but this has to be interpreted by the user. You have to know what to do with the information you are given. Since the GPS is produced mainly as an aid for sighted people (for use in cars or boats), blind and visually impaired have to adjust to this, for example by learning street names. To domesticate an aid like this, the user needs instructions on how to use it, training in using it and the necessary knowledge to interpret the information given by the aid. You have to incorporate a new feature (street names) into your schemas. By getting this knowledge and the necessary training the aid can become a part of your everyday life; it has been domesticated into your local routines. My interviewees who had tried a GPS but didn't own one, said that it had been great using it, but that they needed more instructions and training for it to become domesticated. They had borrowed it for a short period of time and this was not enough to get full control when using it, and learn how to use all the different functions. This seems to be very important when it comes to creating a hermeneutic relationship between a user and an assistive technology; the need for instruction and training. The potential user needs to know how do use and interpret the aid to get the most help out of it, especially when it comes to "technical" aids, like a GPS. Some user groups, for example elderly people, might be sceptical towards technologies that they know nothing about and don't know how to use. It

should be offered instruction and training for orientation aids, just like it is offered for mobility aids. And maybe it is even more important to offer instruction when it comes to orientation aids like the GPS. With mobility aids like the white cane you can to a certain degree figure out how to use it on your own. But with a GPS it is difficult to do this. There is a greater need to have someone to teach and show new users how the different functions work.

The white cane is an available aid, not difficult to obtain and quite cheap. These are factors that are important for many people when getting an assistive technology. In comparison, a guide dog is quite expensive, not that easy to obtain and takes a lot of work and attention. In Norway, both of these mobility aids are financially supported by social services. A GPS based orientation aid on the other hand is not supported, and this was the main reason most of my interviewees didn't own one; it was too expensive. My interviewees emphasized this as one very important factor when consuming assistive technologies. If it is not sponsored by social services, it has to be in a price range that makes it worth buying. There are off course different factors and preferences when making decisions about consumption, but economy seems to be one of the most important ones.

5.2

How to trust an assistive technology?

The white cane was the mobility aid that all of my interviewees had experience with. At the time, none of them had any problems when it came to trust that the cane showed the obstacles in the road ahead of them. But several mentioned that it had been difficult in the beginning. One of my interviewees, who was visually impaired, said that she had trouble adjusting to the fact that she didn't have to always look down on the ground to search for obstacles:

"That was the biggest change. When you are used to looking down all the time to see where you place your feet, and then suddenly start trusting this long thing. (…) I should be able to walk upright like everybody else and trust that the cane detects the obstacles"

For her, it was difficult to let go, and let the cane do the job her sight no longer could do for her. But with a lot of practise and the help from mobility instructors it became easier and easier. Most of my interviewees had started using a white cane when they were quite young, while they were still in elementary school. Most had mobility trainers that taught them how to use the cane, something they all emphasized as very important to create an embodied relationship with the cane. But as they all said, you still need some knowledge about how to move around outside, it is not enough that you know how to use the cane. The skills in being mobile and able to orient yourself seem to be something important when it comes to trusting an aid. Small things, like being able to walk in a straight line when crossing an open space, or getting used to listening for environmental features, are learned through mobility training. This knowledge was highly appreciated by all my interviewees and something that they all meant was necessary if blind and visually impaired wanted to move outside. If you don't trust your own knowledge and skills enough to walk outside, there is no need or use for a white cane or a guide dog.

Walking with a guide dog is a bit different than walking with a white cane. When walking with a dog, you have to put your trust in something else than your own skills to lead you safely past obstacles. You no longer get a full overview of the obstacles in the environment; you are lead past them by the dog. You have to trust the dog to keep on the pavement and follow your directions. But even though my interviewees said that they trusted the dog, a couple of them wanted more control in some situations and chose to use a combination of a white cane and a dog. In this way they could control that the dog kept to the

pavement and lead them back to the pavement if they had to walk into the street to pass an obstacle. The interviewee who used this combination the most had had some accidents when walking only with her dog, and felt a need to know more about the surroundings. When using the combination she was lead past obstacles, but at the same time got information, for example about how far from the curb they were walking:

"I want this safety for my own part; to be sure I walk safely. Not because I don't trust the dog, but because I don't want to transfer any of my insecurity to my dog "

When using a GPS based aid, several of my interviewees were more sceptical then they were towards a guide dog or the white cane. They had heard stories about the technology not working properly and giving people wrong directions. The four interviewees who had tried a GPS said that this was something they had never experienced. Their attitude when using it was not that the GPS would "fix" everything, but they saw it as a practical tool to help them when learning new routes and relieve their memory when walking routes. In the GPS model most of them had tried, they were able to get information about how many satellites that was available, and this made them feel safer. They could avoid areas that weren't covered by the satellites, and this helped them control the accuracy of the information they got. Although this made them more secure, they had different opinions about trusting the GPS. As mentioned in chapter four, one of my interviewees never walked in unknown areas with the GPS. For this, she was still dependent upon sighted company. She said that this was because she had problems trusting the GPS. She was not able to understand why she had problems with this, because when she used it in known areas she had no problems accepting the information the GPS gave her. I would claim that this interviewee had a need for being in full control of a situation. When getting information from the GPS in known areas it was okay because she

knew from her own spatial knowledge that the GPS was correct. In unknown area she didn't have the information to prove the GPS right, and then she became insecure and didn't trust the technology to give her the right information. This reasoning is also seen by Hardin (2002); people often base their trust on something or someone, on their knowledge. The trust occurs when you have enough information not to distrust this something or someone. In every GPS that is produced today, it is a certain room for error. It is not always completely accurate, and because my interviewee knew this she had the need to confirm the information from the GPS with her own knowledge of the environment. When you distrust something or someone, it is often because of some uncertainty and lack of information. You just don't know if the outcome of a relationship will be what you want (Hardin 2002). Even though my interviewee never had any experience with the GPS giving her misleading information, the uncertainty was enough to keep her from walking in completely unknown areas.

Two of my other interviewees had used a GPS to walk in unknown areas. They made a route from one place to another at home, and walked this with the directions from the GPS and a guide dog or a white cane. They were aware that the GPS could give them inaccurate information, but said that because they knew this it didn't bother them much. They used their mobility and orientation skills in combination with the GPS and felt that this combination gave them a lot of help. If the GPS told them that they would reach a crossing in five meters but they could hear that they were already there, they trusted their own skills instead of the information from the GPS. They wanted to be able to walk alone and not be dependent upon others, and this need for independence was bigger than the fear of getting the wrong information from the GPS. They trusted that the GPS gave them correct information most of the time, and used their personal skills to evaluate the situation and not follow instructions from the GPS if they suspected it was inaccurate or wrong. They evaluated the technology by the information they had, and they chose to trust it. My other interviewee evaluated the same

information and chose not to trust it. As Hardin points out, these choices are different from person to person and may also change over time. If one of my interviewees who initially trusted the GPS had many bad experiences getting wrong information he or she might get more careful and start distrusting the GPS instead. It all depends on the information available to you at the moment (Hardin 2002). Almost all of my interviewees had experienced difficulties with trusting an aid, whether it was a white cane, guide dog or a GPS. But as one of my interviewees said:

"You just have to trust it! Otherwise you will just end up sitting at home"

This attitude was something many of my interviewees described. To walk outside and be an active person, you had to take some chances and show courage. It is not always easy, but if the alternative is to be at home all the time, they were willing to take the risk.

5.3

Walking with confidence

One of the results from the report"Å navigere uten syn" (2003), is that insecurity and fear are maybe the biggest obstacle for a blind or visually impaired person who wants to move outside and be active in the community. This was described by several of my interviewees; they often felt scared when walking outside. They were nervous that they would get lost or that something could have changed (for example because of construction work) in the environment that would lead them the wrong way. Because of this, it takes courage to walk alone outside. For many, the easiest solution is to stay at home as much as possible, and only move outside when someone can go with you. But even though this may be an easy solution, it is not necessarily a satisfying solution; to always be dependent on others when you want to

do something is not positive for a person's self esteem (Murphy 1990). Maybe because of this, all my interviewees mentioned more independence as one of the most important things a new assistive technology could give them. The interviewees who had tried a GPS based aid, pointed out this increased independence as one of the most positive things about this experience. It enables you to go places you were not able to go before, and most importantly: you can do it on your own. The possibility to sit at home and "walk through the route" with the GPS and be prepared also gave the interviewees a feeling of independence and comfidence. You could learn more about the route at home and didn't have to repeat it many times together with a sighted. Two of my interviewees also used tactile maps to do this. They said it was great help when learning routes, but that there were so few areas that were available as tactile maps that they couldn't use this as much as they wanted. Although not all of my interviewees who had tried a GPS felt safe enough to walk alone in unknown areas, they all needed fewer repetitions to learn a new route. The GPS also gave a feeling of safety, it could always tell them where they were, and this made it easier to walk a route.

"Because I knew where I was I didn't' have to think all the time. If I was unsure, I only pressed the "where- am-I" button, and the machine told me where I was the whole time. I felt like a king! And I wasn't scared at all!"

This is a description of the first time one of my interviewees walked with a GPS. She felt that she could walk more relaxed, but at the same time feel safe. And this feeling was described by several others of my interviewees as well. The feelings of being safe and at the same time relaxed and not worry that they might forget where they were going, also affected the interviewees self esteem. They got more confident when they weren't afraid to get lost, and didn't have to take a taxi or be dependent on company to get to unknown places. They could

manage on their own! Several interviewees meant that this feeling would encourage them to be more active outside, and they even mentioned the possibility of going on vacation using a GPS. This is another important feature of the GPS; it can help users in large parts of the world and not only in their immediate environment at home. Possibilities of integrating a “tourist mode” and download maps covering different areas was something that several of my interviewees were very exited about.

A GPS can have a lot of different functions, and not all blind and visually impaired are able to use all of these. One example of this are people with more disabilities than just the visual impairment. At the Huseby centre they told me about a girl who was blind an also had a mild cognitive disability, and she used a GPS based orientation aid. Even though she couldn’t use most of the functions because of her cognitive disability, she had learned to press the “where-am-I” button. Just this one function was enough to make her more secure when walking outside. If she got lost or didn’t remember her route she didn’t know how to use the GPS to get back on track, but at least she could tell someone her exact location, and they could come and help her. She had found out how the GPS could help her, and used it in a way she found helpful. She made her own routines that included the GPS.

The white cane and the guide dog are good mobility aids, and when you have learned how to use it, it gives a lot of help. But it is not enough to be mobile, you also have to know how to orient yourself, and here a GPS can be of great help. I will claim that the most difficult thing to adjust to with a GPS is that it takes a lot of courage to use it. You have to be quite tough to walk alone with it because it breaks with the patterns that are so internalized: that blind and visually impaired can not walk alone in unknown areas. Thoughts like this can be difficult to overcome, but I think a good GPS solution can make a lot of people more active and self confident with enough training and demonstration of the aid.

Through domestication and consumption of assistive technology, blind and visually impaired can become more independent and safe when walking outside. To incorporate an object into your daily life, routines and identity is not easy, especially when this involves re-identifying yourself as a stigmatized person. But when the user trusts the aid to lead him or her around in the environment, this trust creates many opportunities.

Chapter 6

Conclusion

The empirical emphasis in this thesis has been on visibility and social identity as blind, how blind and visually impaired move in an environment and the issue of putting trust in an assistive technology. Discussing these topics by using my theoretical frameworks, I have tried to explain what users of assistive technologies need and want to be more confident, independent and more secure when moving in an environment.

Two important factors that makes it difficult to move outside for blind and visually impaired is the changing nature and unpredictability of the environment, and fear and uncertainty. Any assistive technology should have as a goal to overcome these factors by providing the user with enough information to overcome the unpredictability of the environment and invite the user into a safe and trustworthy relationship. The user has to know how to use the aid and how it works, and must be sure that the aid gives correct and accurate information.

The I-Cane foundation sees safety in being visible as blind. By designing the I-Cane as a white cane, they feel that the user will travel safer in the environment. All my interviewees agreed that by showing their impairment they increase their safety, especially in crowded areas or in complex traffic situations. People react to the symbolic meaning of the cane, and this can make it easier for the user in many situations. On the other hand, a couple of my interviewees didn't want to use a cane for the exact same reason; they wanted to choose for themselves when to show their impairment to others. The stigma the white cane creates can be a problem for many potential users of the I-Cane. Many blind and visually impaired choose other aids to avoid being stigmatized when interacting with others. This creates a dilemma when developing a new aid. If one chooses to design it as a white cane, this might exclude some potential users, like the ones that doesn't want to be seen with a white cane or people

that prefer guide dogs. On the other hand, it *is* helpful in many situations to communicate that you are blind. Attitudes among my interviewees showed that if they were presented to an effective mobility and orientation aid that were designed as a white cane; they would want to try it even though they weren't very comfortable with using a traditional white cane. One of my interviewees made a point out of this. She usually didn't use a white cane, but said that if the orientation part of the I-Cane turned out to be good, she would just have to get used to it, even though it was designed as a white cane. A combination of a mobility- and orientation aid that turns out as a success might be able to give the user the confidence and feeling of safety that is needed to travel outside, even though they started out with a negative attitude towards using something designed as a white cane. The need for development of an effective orientation aid seems to overcome the fear of the stigmatization the visibility of the white cane creates.

A GPS is a good aid to create predictability when walking outside. In this thesis I'm arguing that a customized GPS function can be of great help for blind and visually impaired. Both because it helps orientation and can tell you where you are, and because it can make the user more independent from others. The wish to be more independent was something all my interviewees wanted and appreciated in a new aid, and it is also one of the main goals for the I-Cane Foundation. If an orientation aid can create the safety and confidence blind and visually impaired needs to be more active and independent from sighted people it will find a big group of potential users among blind and visually impaired. But what is needed from an orientation aid to create this safety and predictability?

Just like Foulke (1985a), I would claim that the three most important features an orientation aid can provide are to tell you where you are, where you are going and how to get there. These are all things that a GPS can provide for its users. The GPS can plan a trip for

you from one destination to another, or you can make your own routes from place to place. When walking the route, the GPS gives directions and information about the environment as the user travels. In addition, the possibility to prepare for a trip by "walking the route" at home was something my interviewees had positive experience with. This prepared them for what they were going to encounter, and how they could approach any difficulties (for example crossing of large open areas) that might be in the route; it reduced the uncertainty of the environment. To create a safe route, my interviewees also mentioned the importance of being able to make personal routes and your own "points of interest" to remind you of something in the route, and not only follow the suggestions from the GPS. After doing my interviews and listening to experiences and thoughts about GPS based orientation aids from people who had tried it, I would claim that this is where the future lies when it comes to orientation aids for blind and visually impaired. There haven't been many developments in the area of orientation aids and the ones that exist (for example tactile maps) are not always easy to get hold of, and can be quite unpractical to carry around. The GPS has seen a huge development only the last couple of years for orientation and navigation in cars and boats, and if this can be taken advantage of to make a customized version for blind and visually impaired, it would prove to be a great help for orientation. Provided instruction and training from the producers side might prove helpful when it comes to getting the users to trust the aid. At them same time, it is not necessarily a goal that everyone must use the GPS in the same way. Even though one of my interviewees didn't trust the GPS enough to walk unknown places, she thought of it as a great help and often used it when walking outside. It made the environment more predictable for her, and it was not a problem for her that she didn't use it in unknown areas. If the user can find a personal way to incorporate a GPS in his or her daily life that is of great help for this person, the domestication and consumption has been successful, even though the users don't use it exactly as the developers intended. The focus should be on ability to give the

information blind and visually impaired needs in general, but also that each individual user can choose how he or she wants to use the aid. The customization has to give possibilities to the blind and visually impaired as a group and also to the different individuals.

While a GPS is of great help when it comes to orientation, I will argue that a white cane or a guide dog still is the best alternatives for a mobility aid. These are aids that provide easy information; they are simple to use and very helpful. The attempts of developing other kinds of mobility aids, like different kinds of obstacle detectors, have often been too complicated to be efficient. There seems to be two reasons for this: the information was difficult to interpret and the design of the aid made it difficult to use. It is important not to make an aid any more complicated than it needs to be. Looking at the white cane, it is a very simple device, and this is one of the reasons it has been successful for so many years. The communication between the aid and the user has to be fast and easy to interpret. Since the I-Cane Foundation has chosen to design the I-Cane as a white cane, it is important that it is designed in a way that allows the user to actually use the cane as the main mobility aid. Applying an obstacle detector to do the same job as the white cane is not necessary. It might be helpful to have something to detect obstacles in eye level, but not if this interferes with the efficiency of the white cane as a mobility aid. All my interviewees agreed on this when it came to development of new aids; if something is too complicated, unpractical or difficult to use it will not be chosen over the simple and more traditional aids like the white cane or a guide dog.

When it comes to trusting a new assistive technology, instruction and training can have a big impact on the relationship between a user and technologies like the I-Cane. All assistive technologies are dependent upon the knowledge of the user in order to be efficient, and the more knowledge the user has, the more safe he or she will feel when using the aid. The more the user knows about the technology and how it works, the better. Training and

instruction should be provided by the developers. By providing this they ensure that the users are aware of all the possibilities that lies in the aid, even though different user probably will use the aid in different ways.

If I were to give just some concrete advice for future development of assistive technologies, I would claim that the most important thing is to customize the aid to the users needs, but still make the aid as simple as possible. If the aid is difficult to use or understand, it will not attract potential users. There is definitely a need for instruction and training when introducing a new aid to potential users. But it is also very important to let the users domesticate the aid in their own ways, and find out how the aid can be used to overcome their personal disability in the best way possible. Being blind or visually impaired creates difficulties, but with the right aids these difficulties can at least be minimized and make the user more confident, secure and independent when travelling outside.

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